Thesis/
Reports
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Y.

Study to Determine Effects of Fuels Reduction and Exotic Plant Removal on Vertebrates, Vegetation and Water Resources in the Middle Rio Grande Bosque

Agreement No.
01-JV-11221602-272

FINDING OF NO SIGNIFICANT IMPACT (FONSI)

for

Study to Determine Effects of Fuels Reduction and Exotic Plant Removal on Vertebrates, Vegetation and Water Resources in the Middle Rio Grande Bosque

The Middle Rio Grande Conservancy District and the City of Albuquerque Open Space Division propose to study responses of vegetation, birds, bats, herptiles, and hydrology to fuels reduction treatments in Middle Rio Grande riparian woodlands having cottonwood overstories and high fuel loadings of dead wood and exotic woody plants. The objectives of the study are to identify best fuels-reduction and exotic plant removal practices that will simultaneously 1) preserve cottonwoods and other native trees and shrubs, 2) reduce catastrophic fire risk via control of exotic plants, and 3) have positive or least-negative impacts on native wildlife species. Each treatment was designed to attain fuel-loading levels estimated to avert catastrophic fire risk. The Proposed Action (Alternative 9) consists of three treatments: 1) Mechanical removal of dead and down wood and exotic plants (cut stumps and branches of exotics treated with herbicide), 2) Partial mechanical removal of dead, down, and exotics (herbicide) followed by prescribed ground fire, and 3) Mechanical removal of dead, downed, and exotics (herbicide) followed by revegetation with native understory plant species such as New Mexico olive, coyote willow, seep willow, wolfberry and false indigo bush. All three treatments will be implemented within each research block (see Appendix B. map). Before and after treatment implementation, all sites are monitored by the USDA Forest Service Rocky Mountain Research Station for vegetation, bird, bat, reptile, and amphibian, and hydrological responses. Baseline data has been collected on the Study sites for a minimum of two seasons prior to treatment implementation.

This Environmental Assessment reviews alternative fuels reduction treatments at seven study sites within bosque owned by the Middle Rio Grande Conservancy District. Three additional sites will serve as control sites and remain untreated for comparison purposes. The MRGCD holds fee simple title to these ten sites located in Bernalillo, Valencia and Socorro Counties, including the four sites within the Rio Grande Valley State Park. Sites in the Rio Grande Valley State Park (North Block) are co-managed by the MRGCD and the City of Albuquerque Open Space Division through a Joint Powers Agreement (1997). Treatments associated with this Study will be implemented on a total of 16 sites along the Middle Rio Grande riparian bosque (woodland) and involve lands owned and/or managed by the U.S. Fish and Wildlife Service Bosque del Apache Refuge, the Middle Rio Grande Conservancy District, the City of Albuquerque and the Pueblo of Cochiti.

The Middle Rio Grande Conservancy District and the City of Albuquerque Open Space Division, in concert with other Study cooperators, considered seven alternatives to the Proposed Action (Alternative 9) and "No Action" Alternatives. Alternatives 2 – 8 were considered and eliminated because they did not meet both components of the Study's

overall purpose. These components include the reduction of hazardous fuels at all sites through the removal of dead and down wood and exotic species, and meeting the overall study goals that would evaluate all practical treatments. As a result, alternatives that restricted herbicide application, revegetation or prescribed burning were eliminated. Alternatives 2-8 are described, and the "No Action" Alternative and Alternative 9 (Proposed Action) are described and analyzed in the Final Environmental Assessment titled "Study to Determine Effects of Fuels Reduction and Exotic Plant Removal on Vertebrates, Vegetation and Water Resources in the Middle Rio Grande Bosque."

Alternative 9 was selected as the Proposed Action because hazardous fuels will be reduced on each treatment site and the alternative meets the Study goals. The exotic trees to be removed form a mid-story canopy on the project sites, and this mid-story structure will be replaced with native species on specific sites for comparison to sites left to revegetate naturally. This project is designed to answer important questions about removal and replacement of this mid-story canopy, and to evaluate methods for removing and maintaining bosque fuels. At the request of U.S. Fish and Wildlife Service and USDA Forest Service personnel, a prescribed burn treatment has been proposed as a follow-up treatment to fuels reduction to assess whether a low-intensity burn could be used to maintain fuel loads and possibly stimulate (but not harm) growth of native vegetation.

Fuels reduction treatments, herbicide application, prescribed burns and revegetation will be accomplished according to strict prescriptions tailored to individual site conditions and are designed to minimize impacts to the environment and insure public safety. Herbicide use is targeted to cut tree stumps and branches, is not broadcast (aerially sprayed over a wide area), and is supervised by licensed applicators.

Treatments will be implemented in blocks over 3-4 years to adhere to the Study design and to minimize any impacts to wildlife.[1] Treatments will be completed by 2005, depending, in part, on safe conditions for prescribed burns. Sites will be monitored each year post-treatment for five years, then every five years.

The Proposed Action is anticipated to have several beneficial effects that are consistent with recommendations in the Bosque Biological Management Plan (1993). Fuels reduction treatments in the bosque would reduce the threat of intense wildfire that kills native riparian communities and threatens adjacent properties and public safety. Removal of exotic trees could reduce competition to and encourage regeneration of native bosque vegetation, improving habitat diversity. Removing water-loving exotic species could also reduce evapotranspiration, increasing available water on the sites and perhaps to the Rio Grande system. Fuels reduction treatments provide economic development opportunities for contract crews and available wood for value added

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[1] See Study Plan in Appendix A of the EA accompanying this document. "*Effects of Fuels-Reduction and Exotic Plant Removal on Vertebrates, Vegetation, and Water Resources in Southwestern Riparian Ecosystems*", Principal Investigators: Deborah M. Finch, Alice Chung-MacCoubrey, Jeffrey Kelly, Roy Jemison, Burt Pendleton, Rosemary Pendleton. Also, see the ***Cumulative Effects*** section of this Environmental Assessment.

products or firewood. Low-intensity prescribed burns may maintain low fuel loads in the bosque, enhance nutrient cycling and stimulate new growth of native species. The proposed treatments and subsequent monitoring will provide much needed science-based information that bosque managers could use to develop best management practices for fire and exotic management projects.

Without treatments, dead wood would continue to accumulate on Study sites and exotic trees such as salt cedar and Russian olive would proliferate. High fuel loads and lack of flooding put the sites at high risk of catastrophic fire and the vegetation community would convert from native to exotic-dominated. Public safety and adjacent properties would continue to be at risk from bosque fires. Short-term localized displacement of some bird species and small mammals and short-term air quality impacts resulting from treatments would be avoided, but wildfire and the proliferation of exotic trees would degrade or destroy habitat in the future. Without this study, bosque managers will lack adequate information to develop environmentally sound fire management projects.

Based on the findings of the attached Environmental Assessment, the Proposed Action would not have any significant adverse effects on natural, human or cultural resources and does not constitute a major Federal action as defined by the National Environmental Policy Act of 1969 (as amended). Therefore, an environmental impact statement is not required. A Biological Assessment (BA) for this Study was submitted to the U.S. Fish and Wildlife Service Ecological Services Office in Albuquerque, NM. For a copy of the BA, please contact John Taylor, Biologist, Bosque del Apache N.W.R., P.O. Box 1246, Socorro, NM. 87801.

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Date

Subhas K. Shah
Chief Engineer & Chief Executive Officer
Middle Rio Grande Conservancy District

_____ _____

Date

Jay Hart
Superintendent
City of Albuquerque Open Space Division

FINAL ENVIRONMENTAL ASSESSMENT

Study to Determine Effects of Fuels Reduction and Exotic Plant Removal on Vertebrates, Vegetation and Water Resources in the Middle Rio Grande Bosque

Middle Rio Grande Conservancy District (MRGCD)
City of Albuquerque (COA) Open Space Division
Albuquerque, New Mexico

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April 10, 2002

Introduction

The Middle Rio Grande Conservancy District and the City of Albuquerque Open Space Division propose to reduce fuel loads on lands within its jurisdictions that lie within in the Middle Rio Grande riparian forest ("bosque"). This Environmental Assessment (EA) reviews alternative fuels reduction treatments at seven study sites within bosque owned by the Middle Rio Grande Conservancy District. Three additional sites will serve as control sites and remain untreated for comparison purposes. The MRGCD holds fee simple title to these ten sites located in Bernalillo, Valencia and Socorro Counties, including the four sites within the Rio Grande Valley State Park. Sites in the Rio Grande Valley State Park (North Block) are co-managed by the MRGCD and the City of Albuquerque Open Space Division through a 1997 Joint Powers Agreement. Efforts are being proposed to affect a total of 16 sites (see map in Appendix B.) along the Middle Rio Grande bosque in Sandoval, Bernalillo, Valencia, and Socorro Counties, New Mexico, and involve lands owned and managed by the U.S. Fish and Wildlife Service, the Middle Rio Grande Conservancy District, the City of Albuquerque, and the Pueblo of Cochiti.

Proposed Action

We propose to study responses of vegetation, birds, bats, herptiles, and hydrology to fuels reduction treatments in Middle Rio Grande woodlands having cottonwood overstories and high fuel loadings of dead wood and exotic woody shrubs and trees. Research is directed toward identifying best fuels-reduction and exotic plant removal practices that will simultaneously 1) preserve cottonwoods and other native trees and shrubs, 2) reduce catastrophic fire risk via control of exotic plants, and 3) have positive or least-negative impacts on native wildlife species.

Each treatment is designed to attain fuel-loading levels estimated to avert catastrophic fire risk. Three treatments are proposed: 1) Mechanical removal of dead and down wood and exotic trees (cut stumps or branches of exotic trees are treated with herbicide); 2) Mechanical removal of dead and down wood and exotics trees (herbicide) followed by prescribed ground fire, and 3) Mechanical removal of dead and down wood and exotic trees (herbicide) followed by revegetation with native understory plant species such as New Mexico olive, coyote willow, seep willow, wolfberry and false indigo bush. Each block of four sites will receive one treatment on each of three sites, and one control site will remain undisturbed. Before and after treatment implementation, all sites are monitored for vegetation, bird, bat, reptile, amphibian and hydrological responses.

Purpose and Need Statement

Fuels reduction treatments are needed in southwestern riparian ecosystems to prevent the incidence of catastrophic wildfire and to reduce risks of fire damage to residents. A prime example of this need is the Middle Rio Grande bosque, where fuels reduction would: 1) prevent further spread of catastrophic wildfire, 2) control escalating costs of bosque firefighting, 3) reduce risks of fire damage for residents who live near the bosque, and 4) preserve native riparian plant and animal communities. Exotic salt cedar (*Tamarix ramosissima*) and Russian olive (*Elaeagnus angustifolia*) as well as dead and down wood are fuels that have led to increased fire frequency and risk in the Middle Rio Grande bosque (Stuever, 1997). Several agencies have engaged in local case-by-case actions to reduce bosque fuels and control exotics, and their results have been shared at Middle Rio Grande Bosque Consortium meetings.

Treatments that remove invasive woody shrubs from southwestern riparian ecosystems, however, have unknown consequences for wildlife species, including sensitive, threatened, and endangered vertebrate species known to inhabit the Rio Grande bosque. Comparing wildlife, vegetation, and abiotic responses to a variety of treatment types is essential for determining which treatments are least ecologically costly and most advantageous in reducing fire risk while sustaining biological diversity, sensitive species populations, and ecosystem functioning. A concomitant purpose is to reduce the amount and density of exotic woody plants, and to identify fuels reduction practices that will simultaneously preserve cottonwoods and other native plants, reduce wildfire and control spread of exotic woody shrubs, and have positive or neutral impacts on wildlife species.

The Study proposes to monitor vegetation, bird, bat, reptile, amphibian and hydrological responses to 3 fuels reduction treatments in the Middle Rio Grande bosque. A Memorandum of Understanding (MOU) that defines collaboration among federal, state, and municipal agencies and specifies organizational roles, authorities and contacts has been signed by participating entities. This study is conducted under the auspices of the Middle Rio Grande Ecosystem Management Research Program (http://www.fs.fed.us/rm/albuq) which is managed by the Rocky Mountain Research Station's Albuquerque Laboratory in collaboration with University of New Mexico, Cibola and Santa Fe National Forests, U.S. Fish and Wildlife Service Southwest Region, Bureau of Reclamation, City of Albuquerque, and New Mexico Energy, Minerals and Natural Resources Department (EMNRD). Federal, State and Tribal entities such as the U.S.

Department of Agriculture, the EMNRD Forestry Division and the U.S. Bureau of Indian Affairs are also participating in the project.

The proposed Study is consistent with recommendations in the Middle Rio Grande Conservancy District's Water Policies Plan (1993), the Rio Grande Valley State Park (RGVSP) Management Plan (1983) and the RGVSP Amendment (scheduled for approval in 2002). It is also consistent with the City of Albuquerque's Bosque Action Plan. The Study implements Recommendations 7, 11, 13, 14, 16, 17, 18, 19 and 21 of the 1993 Bosque Biological Management Plan. The U.S. Fish and Wildlife Service, the USDA Forest Service and the EMNRD Forestry Division are supporting the Study with grants to help implement treatments.

Alternatives Considered but Eliminated

The Study Team considered a total of 9 Alternatives including the "No Action" Alternative. Seven alternatives were eliminated because they did not meet both components of the project's overall purpose. These components include the reduction of hazardous fuels at all treatment sites through the removal of dead and down wood and exotic species, and meeting the overall study goals that would evaluate all practical treatments. As a result, alternatives that restricted herbicide application, revegetation or prescribed burning were eliminated. (Table 1).

Table 1. Alternatives Initially Considered for Fuels Reduction and Study Goals

Alternative	Would the Alternative Meet Fuel Load Reduction Purposes?	Would the Alternative Meet Study Goals?
1) No Action	Mandated by NEPA	Mandated by NEPA
2) Mechanical Removal and Herbicide Application	Yes	No
3) Mechanical Removal, Herbicide Application and Revegetation	Yes	No
4) Mechanical Removal and Prescribed Burning	Yes	No
5) Mechanical Removal, Prescribed Burning and Revegetation	Yes	No
6) Mechanical Removal	Yes	No
7) Mechanical Removal and Revegetation	Yes	No

Alternative	Would the Alternative Meet Fuel Load Reduction Purposes?	Would the Alternative Meet Study Goals?
8) Mechanical Removal, Herbicide Application, and Prescribed Burning.	Yes	No
9) Mechanical Removal, Herbicide Application, Prescribed Burning, and Revegetation	Yes	Yes

As a result of failure to meet both components of the Study's overall purpose the following alternatives were eliminated:

•Alternative 2) Mechanical Removal of Dead and Down Wood and Herbicide Application on Exotic Species

•Alternative 3) Mechanical Removal of Dead and Down Wood, Herbicide Application on Exotic Species, and Revegetation with Native Species

•Alternative 4) Mechanical Removal of Dead and Down Wood and Prescribed Fire

•Alternative 5) Mechanical Removal of Dead and Down Wood, Prescribed Fire, and Revegetation with Native Species

•Alternative 6) Mechanical Removal of Dead and Down Wood

•Alternative 7) Mechanical Removal of Dead and Down Wood and Revegetation with Native Species

•Alternative 8) Mechanical Removal of Dead and Down Wood, Herbicide Application on Exotic Species, and Prescribed Fire

Alternatives Considered and Evaluated Including the Proposed Action

The two alternatives considered for analysis include the "No Action" Alternative and Alternative 9. The "No Action" Alternative does not meet the project purpose, but its inclusion in this Assessment is mandated by the National Environmental Policy Act (NEPA). Under the "No Action" alternative, hazardous fuels reduction, exotic tree removal, prescribed burn and revegetation treatments would not be implemented. Alternative 9 meets both components of the project purpose, which are to reduce hazardous fuels through the removal of dead and down

wood and exotic species, and to meet the overall Study goals. The Proposed Action (Alternative 9) is presented below.

Alternative 9: Mechanical removal of dead and down wood, herbicide application on exotic species, prescribed fire, and revegetation with native species.

Under this alternative, the full suite of treatments outlined above would occur in each reach of the Rio Grande. Common to all treatments except the control would be the removal of dead and down wood by crews according to fuel loading targets to meet levels necessary to avert catastrophic fire risk (Wicklund and Najmi, 1998). The amount of residual fuel loading required to avert catastrophic fire is estimated to be 10-12 tons/acre with fuel depths of less than 6 inches. When removing dead and down wood, ladder fuels (fuels that carry fires from the ground into tree canopies) will also be removed. Also common to all treatments but the control would be the removal of exotic woody plants by crews and the application of triclopyr (Garlon 3a and 4) herbicides to freshly cut stumps or branches.

In addition to removal of dead and down wood and exotic trees, follow-up treatments of prescribed fire and revegetation will occur on some treatment sites. At the request of U.S. Fish and Wildlife Service and USDA Forest Service personnel, a prescribed burn treatment has been proposed as a follow-up treatment to fuels reduction to assess whether a low-intensity burn could be used to maintain fuel loads and possibly stimulate (but not harm) growth of native vegetation. Prescribed burning will occur according to burn plans specifying parameters such as temperature, humidity, fuel moisture, weather and safety plans. Burning under strict weather parameters and careful adherence to fuels reduction prescriptions should assure a cool burn to avoid native species mortality yet remove lighter accumulated ground fuels. Revegetation treatments would occur on some sites to replace exotic mid-canopy structure (tree structure below mature cottonwoods) for wildlife benefits. Understory plantings, either containerized stock or dormant poles, will augment existing native understory plant structure (Fenchel et al 1996, 1998). Generally, in shallow water tables (<6') containerized plantings of New Mexico olive (*Forestiera neomexicana*), wolfberry (*Lycium andersonii*), currant (*Ribes spp.*) and screwbean mesquite (*Prosopis pubescens*) will be made. In deeper water tables (6-9'), dormant pole plantings will be made of amorpha (*Amorpha fruiticosa*), coyote willow (*Salix exigua*), or seepwillow (*Baccharis glutinosa*). These plantings are made by augering to the water table, inserting a dormant slender pole cutting, and backfilling the hole.

Table 2. Alternatives Considered and Evaluated

Issue/Alternative	No Action	Alternative 9
Air	Without fuels reduction treatments, short-term air quality impacts of catastrophic fires could be significant.	Short term effects possible due to prescribed burning; vehicle use; minor short term disturbances to soils affecting particulate concentrations in ambient air.
Water	Without fuels reduction, high densities of exotic phreatophytes (i.e. salt cedar and Russian olive) would continue to use water through evapotranspiration. Catastrophic fires may convert communities to a higher percentage of exotic trees, with possible increases in evapotranspiration.	Positive effects by reducing evapotranspiration through the removal of excess exotic trees. Water salvage could benefit Rio Grande silvery minnow and Southwestern willow flycatcher habitat. Herbicides have minimal or no effects depending on application. Soil disturbance from project activities is unlikely to cause any discernible water quality impacts to the Rio Grande or adjacent MRGCD conveyance structures.
Soils	Catastrophic fires could have either negative or positive effects. (Possible sterilization or stimulation affecting nutrient cycles/levels).	Herbicides have minimal or no effects on soil leaching. Low intensity prescribed burns could enhance nutrient cycling and vegetative regeneration of native species. Possible soil compaction due to machinery use.

Issue/Alternative	No Action	Alternative 9
Habitat	Short-term effects of no fuels reduction treatments are mixed; long-term effects would be negative due to the high risk of catastrophic fire with loss of vegetation structure and diversity of native plants.	Fuels reduction implementation would rearrange the forest and fuel structure to enhance native plant communities and avert catastrophic wildfire. The removal of secondary understory (exotic trees and dead and down wood) may adversely affect wildlife that use these materials for foraging, concealment and nesting. Native plant communities are favored through invasive species removal. Prescribed low intensity burns could have mixed short-term effects on native plant and animal communities but effects will remain unknown unless tested.
Threatened and Endangered (T&E) and other Species of Concern	Main species of concern is the Southwestern willow flycatcher. Catastrophic wildfire would negatively impact native riparian habitats important to the Yellow-billed cuckoo (a candidate species), Southwestern willow flycatcher and bald eagle if present. (Reference Biological Assessment).	No Southwestern willow flycatchers were detected on Study sites. Treatment implementation will take place outside of the primary avian breeding season and is not likely to adversely affect the Southwestern willow flycatcher, Yellow-billed cuckoo or bald eagle. Native understory trees may proliferate when exotic trees are removed and provide habitat for T&E species. Proposed action will have no direct effects on the Rio Grande silvery minnow (Reference Biological Assessment).
Urban Interface and Public Safety	Risk of catastrophic fire is high on sites with no fuels reduction, posing a risk of property damage and other possible harm to adjacent residents. Visability in and through the bosque itself will remain low on most sites without treatments.	Detailed burn plans and modeling for prescribed burns will address contingencies to assure public safety, prevent loss of property and minimize short-term air quality impacts. Loss of life and property from catastrophic wild fire would be reduced. Prescribed burns would cause short-term visibility impacts and odors. Some noise from chainsaw use may be audible to adjacent landowners for one winter season.

Issue/Alternative	No Action	Alternative 9
Recreational Access	Without fuels reduction, catastrophic fires would cause loss or impairment of recreational uses, facilities, natural resources and aesthetic values. Fires pose a safety threat to the recreating public.	Recreational access and public safety are enhanced through the removal of non-native vegetation and dead and down wood. Opportunities exist to interpret bosque management and resources through treatments. Recreational access to project sites would be temporarily interrupted during the treatment period.
Socioeconomic	The lack of fuels reduction and forest thinning, as demonstrated in the Cerro Grande fire, has had tremendous socioeconomic effects including loss of property, etc. High costs of fire suppression and restoration of burned areas are absorbed by taxpayers. Loss of riparian vegetation to fire can lower adjacent property values and recreation opportunities.	Proposal provides employment and other community benefits: reduced fire risk; enhanced public safety; forest products; preservation of natural resource and of community resources. Economic development possibilities exist through small-diameter wood product utilization. Other ancillary benefits such as firewood are also provided to the community.
Cultural Resources	No impacts to cultural or historic properties	No cultural resources are known to exist on the project sites. Access to project sites will be off existing roads and project activities will have no foreseen impacts on cultural and historical properties. Project sites are in the Rio Grande floodway, previously disturbed by recurrent flooding and flood control activities during the 20th century. The rehabilitation of original levee structures in the Middle Rio Grande (deemed by the New Mexico Historic Preservation Officer to be of historic importance) was mitigated by the Corps of Engineers through historical narratives, drawings and photos (U.S. Corp of Engineers, 1997).

Table 3. Treatment Allocations for Middle Rio Grande Conservancy District Sites

Treatments	Dead and down and exotic removal with herbicide	Revegetation	Prescribed low-intensity burn	Control (no treatment)
Site Name				
North 1				
North 2				
North 3				
North 4				
Middle 1				
Middle 2				
Middle 3				
Middle 4				
South 1				
South 2				

Table 4. Degree of Impact for Two Alternatives for Fuels-Reduction and Exotic Plant Removal on MRGCD/COA sites

Issue	"No Action" Alternative	Alternative 9. Dead and Down Wood Removal, Exotic Plant Control, Prescribed Fire
Air Quality	High Impact	Moderate Impact
Water Quality	No Impact	No Impact
Soil Erosion	No Impact	Moderate Impact
Wildlife	High Impact	Moderate Impact
Habitat	High Impact	Moderate Impact
Listed Species	No Impact	No Impact
Human Safety	High Impact	Moderate Impact
Economic Development	No Impact	Moderate Impact
Cultural Resources	No Impact	No Impact
Chemical Fate	No Impact	Low Impact
Costs	High Impact	High Impact

Affected Environment

General Description

The project area is located within the Middle Rio Grande's riparian zone (bosque). This riparian ecosystem was historically characterized by seasonal flooding that created a changing mosaic of riparian and wetland communities of diverse ages, structures and sizes. Flooding scoured the riverbed and adjacent riparian areas, creating bare soil areas where seeds could germinate. The germination and survival of native bosque vegetation such as cottonwood and willow was dependent on the timing, magnitude and duration of peak flows during spring and summer.

In the 1930's the MRGCD constructed levees to control flooding from the Rio Grande and created a consolidated system for irrigation water delivery. This new system included riverside and interior drains to lower the high water table in the valley and reclaim waterlogged lands. Riparian vegetation outside the levees became disconnected and many wetlands disappeared. When jetty jacks were installed in the 1950's and 1960's by the Bureau of Reclamation for the MRGCD to control the movement of sediment and debris from high flows, the resulting sediment deposits encouraged the recruitment of cottonwoods. The river was channelized and the historic peak flood flows reduced by Cochiti Dam, allowing more stability in the riparian

zone for the growth of new seedlings. The nearly continuous strip of bosque between the levees and the river that we see today is a product of these major changes in water and sediment management. The absence of key historic processes such as large volume floods created a bosque that differs significantly from its historic character, and where native species, adapted to regenerating through flood disturbances, are being replaced by exotic species such as Russian olive, salt cedar and Siberian elm (*Ulmus pumila*). Invasive species such as Russian olive and salt cedar contain large amounts of volatile oils, posing a greater fire risk to cottonwoods. The absence of large scale flooding that promotes decomposition, and the introduction of non-native trees, has greatly increased the woody material in the bosque and the incidence of catastrophic (stand-killing) fires (Najmi, 2001).

Human population increases within the four counties (Bernalillo, Valencia, Sandoval and Socorro) in the MRGCD range from approximately 16% to 46% between the years 1990 and 2000 (New Mexico Bureau of Business and Economic Research, 2001). Former agricultural lands adjacent to the bosque have been and are being converted to residential developments at an alarming rate. These developments are at risk from catastrophic bosque fires. Increasing recreational use of the bosque, as a result of population growth, increases wildfire risk. The MRGCD and cooperators such as the City of Albuquerque Open Space Division and the Socorro Save Our Bosque Task Force are currently working to reduce fire risk by removing dead and down wood and non-native trees to prescription with unknown impacts to wildlife, particularly migratory birds. Bosque managers need information to design fuels reduction projects that will simultaneously prevent catastrophic fires and have positive or least-negative wildlife effects.

Terrestrial habitat in the bosque primarily consists of the cottonwood forest between the levees of the Rio Grande but also contains non-native dominated stands, sandbars and some shrublands. Rio Grande cottonwood (*Populus fremontii* var. *wislizenii*) trees that range in canopy density from very dense to sparse dominate most of this habitat. The understory consists of both native and introduced species in varying densities. Native shrubs such as false indigo bush (*Amorpha fruticosa*), New Mexico olive (*Forestiera neomexicana*), willow (*Salix* and *Baccharis* sp.), golden currant (*Ribes aureum*), wolfberry (*Lycium andersonii*) and screwbean mesquite (*Prosopis pubescens*) and riparian grasses such as alkali sacaton (*Sporobulus airoides*), sand dropseed (*Sporobulus cryptandrus*), alkali muhly (*Muhlenbergia asperifolia*) and saltgrass (*Distichlis stricta*) exist in the Middle Rio Grande bosque. Native species are being challenged by introduced, invasive species such as Russian olive, salt cedar, Siberian elm and mulberry (*Morus alba*). These introduced species have become the dominant understory in many parts of the bosque and, in the case of salt cedar, have also formed monotypic stands over large acreages. Over time these introduced species could replace cottonwoods and other native species and become the dominant species in the Middle Rio Grande bosque (Crawford, et al. 1993).

Wildlife is abundant in the bosque. Rodents such as the white-footed mouse appear to be the most common small mammals. Other species include bats, raccoons, gophers, muskrat and beavers. Carnivores such as bobcat, gray fox, striped skunk, coyote and long-tailed weasel are also present. Other mammals found in the bosque include desert cottontail, rock squirrel, porcupine and jackrabbit. Upland species such as black bear, elk and mountain lion have been spotted on rare occasions in the bosque. Mule deer were once common throughout the bosque

but are now primarily found in protected areas such as wildlife refuges with open meadows and marshes. Domestic livestock graze in parts of the bosque and feral and domestic cats and dogs are relatively common (Crawford, et al. 1993).

Arthropods such as insects and spiders exist in great diversity in the bosque. They provide critical food for birds and fish and are important players in controlling vital natural processes such as decomposition and seed germination.

Between 250 and 300 species of birds are present in the bosque, utilizing a variety of habitats and forest structures. The Rio Grande is a major flyway for migratory birds. Cottonwood forests are thought to be particularly important to maintaining a high diversity of bird species because they appear to provide better habitat for arthropods, an important protein source, than introduced tree species. In several studies, investigators found that cottonwood-dominated habitats support higher number of bird species than do exotic-dominated or monotypic habitats (Crawford, et al. 1993). Wetland, wet meadow and marsh habitats also provide important habitat for birds, as do thousands of acres of irrigated farmlands adjacent to the bosque.

Examples of bosque resident and migrant birds include mallard and pintail ducks, sandhill cranes, snowy and common egrets, bald eagles, snow and Canadian geese, great blue heron, wild turkey, willow flycatcher, bank swallows, red-tailed hawks, belted kingfishers, white-breasted nuthatches and dark-eyed juncos (Crawford, et al. 1993).

Bat species likely to be present in the bosque include: little brown myotis, Yuma myotis, big brown bat, Mexican free-tailed bat, pallid bat, Townsend's big-eared bat, eastern and western red bats, hoary bat and silver-haired bat (Findley, et al. 1975).

There are approximately 57 species of reptiles and amphibians that may occur in the Middle Rio Grande valley. Species include painted turtle, spiny softshell turtle, collared lizard, Chihuahuan whiptail, gopher snake, woodhouse toad, Great Plains skink, northern leopard frog and bullfrog (U.S. Army Corps of Engineers, 1997). Much of the Middle Rio Grande bosque is no longer seasonally flooded by the river, so bosque wetlands (including marshes, wet meadows and standing water) tend to fed by perennially or seasonally high water tables in areas with greater surface-groundwater connection. No ponds are present on the MRGCD research sites, although seasonally high water tables may be present on some sites. Preliminary data collected in 2001 from groundwater monitoring wells indicate that the water table in the Study sites ranges from approximately 2 to 11 feet below the ground surface. The water table may be more shallow (< 2 feet) or deeper (> 11 feet) in places depending on sub-surface hydrology (Jemison, 2001).

Action Area Description

The ten sites analyzed in this EA are located in the Middle Rio Grande bosque in the Rio Grande floodway and in the old river channel. A map of the project sites is attached.

The four North Block sites are located in Bernalillo County near Albuquerque, New Mexico and within the Rio Grande Valley State Park. The sites are south of Rio Bravo Boulevard and north

of Interstate 25, both east and west of the Rio Grande.

The four Middle Block sites are in Valencia County, located near Bosque Farms, Los Lunas, Jarales and Bernardo, New Mexico north of State Highway 60. Sites are both east and west of the Rio Grande.

The two South Block sites are in southern Valencia and Socorro Counties, located near Bernardo and Lemitar, New Mexico. Sites are located both west and east of the Rio Grande.

Specific Site Descriptions

NORTH BLOCK

North 1 – Located approximately 1.0 – 1.7 miles south of the gate at Rio Bravo Blvd. in Albuquerque on the westside levee.

Vegetation. The native overstory vegetation is dominated by mature cottonwoods (90 trees/ha 5cm DBH) and Goodding's willow (18 trees/ha). Exotic overstory species include Siberian elm and Mulberry. The understory is generally a thick tangle of salt cedar (434 stems/ha) and Russian olive (235 stems/ha). Other native understory species include coyote willow, currant, seepwillow, and New Mexico olive.

Birds. Black–chinned hummingbirds are notably abundant on this site. Common Birds include Black-headed grosbeaks, Blue grosbeaks, Lazuli bunting, Indigo buntings, Downy woodpeckers, White-breasted nuthatches, American crows, Spotted towhees, Yellow-breasted chats, Bewicks wrens, and Summer tanagers. It is likely that all of these species breed on the site. Yellow-billed cuckoos also occur on this site and detection rates range from 0 to 2 birds per count-day. Identified nests include Black-chinned hummingbirds, Downy woodpeckers, Cooper's hawks, Mallards and Black-capped chickadees. Southwestern willow flycatchers were not detected on this plot during either weekly surveys or the standard USFWS Southwestern willow flycatcher surveys in 2000 and 2001 but use this site in migration.

Amphibians, Reptiles and Mammals captured: Woodhouse's toad; New Mexican whiptail; Great Plains skink, desert shrew, deer mouse, bull snake, Couch's spadefoot, Prairie lizard and Chihuahuan whiptail.

North 2 - Located approximately 2.5 – 3.3 miles south of the gate at Rio Bravo Blvd. in Albuquerque on the westside levee.

Vegetation. The native overstory vegetation is dominated by mature cottonwoods (198 trees/ha > 5cm DBH) and Goodding's willow (54 trees/ha). Exotic overstory species include Siberian elm and mulberry. The understory is generally a thick tangle of salt cedar (343 stems/ha) and Russian olive (524 stems/ha). Other native understory species include coyote willow, currant,

seepwillow, and New Mexico olive.

Birds. Black–chinned hummingbirds are notably abundant on this site. Common birds include Black-headed grosbeaks, Blue grosbeaks, Downy woodpeckers, White-breasted nuthatches, American crows, Lazuli bunting, Indigo buntings, Spotted towhees, Western wood-peewees, Ash-throated flycatchers, Yellow-breasted chats, Bewicks wrens, and Summer tanagers. It is likely that all of these species breed on the site. Yellow-billed cuckoos also occur on this site, and detection rates range from 0 to 2 birds per count-day. Identified nests include Black-chinned hummingbirds, Ash Throated flycatchers, Mourning doves, Summer tanagers, European starlings, Northern flickers, Cooper's hawks, Bewicks wrens, White-breasted nuthatches, Black-capped chickadees and Mallards. Southwestern willow flycatchers were not detected on this plot during either weekly surveys or the standard USFWS Southwestern willow flycatcher surveys in 2000 and 2001 but use this site in migration.

Amphibians, Reptiles and Mammals captured: Woodhouse's toad; New Mexican whiptail; Great Plains skink, desert shrew, New Mexico spadefoot, Prairie lizard and Chihuahuan whiptail.

Fuel loading: Average fuel loading across the site is approximately 29 tons/acre with an average fuel depth of 12 inches.

North 3 – Located approximately 4.9 – 5.6 miles south of the gate at Rio Bravo Blvd. in Albuquerque on the westside levee.

Vegetation. The native overstory vegetation is dominated by mature cottonwoods (271 trees/ha 5cm DBH) and Goodding's willow (36 trees/ha). Exotic overstory species include Siberian elm and mulberry. The understory is generally a thick tangle of salt cedar (976 stems/ha) and Russian olive (289 stems/ha). Other native understory species include coyote willow, currant, seepwillow, and New Mexico olive. There is a fair amount of tree of heaven on the south end of this site.

Birds. Black–chinned hummingbirds are notably abundant on this site. Common birds include Black-headed grosbeaks, Blue grosbeaks, Downy woodpeckers, White-breasted nuthatches, Lazuli bunting, Indigo buntings, American crows, Spotted towhees, Yellow-breasted chats, Bewicks wrens, and Summer tanagers. It is likely that all of these species breed on the site. Yellow-billed cuckoos also occur on this site, and detection rates are 0-2 birds per count-day. Identified nests include Black-chinned hummingbirds, Downy woodpeckers, Cooper's hawks, Mallards and Black-capped chickadees. Southwestern willow flycatchers were not detected on this plot during either weekly surveys or the standard USFWS Southwestern willow flycatcher surveys in 2000 and 2001 but use this site in migration.

Amphibians, Reptiles and Mammals captured: Woodhouse's toad; New Mexican whiptail; Great Plains skink, desert shrew, bull snake, Plains black-headed snake and Chihuahuan whiptail.

Fuel loading: Average fuel loading across the site is approximately 12 tons/acre with an average fuel depth of 2.5 inches.

North 4 - Located on the eastside levee road off Shirk Avenue in Albuquerque. The site begins approximately .4 miles from the second levee gate.

Vegetation. The native overstory vegetation is dominated by relatively large mature cottonwoods (90 trees/ha 5cm DBH) with few Goodding's willows (0 trees/ha). Exotic overstory species include Siberian elm and mulberry. The understory is generally more open than the other sites in this block and consists of salt cedar (561 stems/ha) and Russian olive (72 stems/ha). Other native understory species include coyote willow, currant, seepwillow, and New Mexico olive.

Birds. Common birds include Black-chinned hummingbirds, Black-headed grosbeaks, Blue grosbeaks, Downy woodpeckers, Lazuli bunting, Indigo buntings, White-breasted nuthatches, American crows, Spotted towhees, Yellow-breasted chats, Bewicks wrens, and Summer tanagers. It is likely that all of these species breed on the site. Yellow-billed cuckoos also occur on this site, and detection rates range from 0 to 2 birds per count-day. Identified nests include: Black-chinned hummingbirds, Northern flickers, Downy woodpeckers, Cooper's hawks, Ash-throated flycatchers, Mourning doves, Bewicks wrens and Black-capped chickadees. Southwestern willow flycatchers were not detected on this plot during either weekly surveys or the standard USFWS Southwestern willow flycatcher surveys in 2000 and 2001 but use this site in migration.

Amphibians and Reptiles captured: Plains spadefoot; New Mexican whiptail; Desert grassland whiptail; desert shrew; deer mouse; Couch's spadefoot; New Mexico spadefoot; Great Plains skink and Chihuahuan whiptail.

Fuel Loading: Average fuel loading across the site is approximately 28 tons/acre with an average fuel depth of 15 inches.

MIDDLE BLOCK

Middle 1 – Located approximately 2.6 – 3.5 miles north of gate at Main Street in Los Lunas on eastside levee.

Vegetation. The native overstory vegetation is dominated by mature cottonwoods (198 trees/ha 5cm DBH) with few Goodding's willows (0 trees/ha). Exotic overstory species include Siberian elm and mulberry. The understory is generally open and consists of salt cedar (180 stems/ha) and Russian olive (72 stems/ha). Native understory species include coyote willow, currant, and seepwillow.

Birds. Common birds include Black-chinned hummingbirds, Black-headed grosbeaks, Blue grosbeaks, Downy woodpeckers, White-breasted nuthatches, American crows, Lazuli bunting, Indigo buntings, Spotted towhees, Yellow-breasted chats, Bewicks wrens, and Summer tanagers.

It is likely that all of these species breed on the site. Yellow-billed cuckoos also occur on this site, detection rates range from 0 to 2 birds per count-day. Identified nests include Black-chinned hummingbirds, Bushtits, Spotted towhee, Black-headed grosbeak, Downy woodpeckers, Cooper's hawks, Mourning doves and Bewicks wrens. Southwestern willow flycatchers were not detected on this plot during either weekly surveys or the standard USFWS Southwestern willow flycatcher surveys conducted in 2000 and 2001 but use this site in migration.

Amphibians, Reptiles and Mammals captured: Woodhouse's toad; Prairie/fence lizard; New Mexican whiptail; Chihuahuan whiptail; desert shrew; deer mouse; Common garter snake and Common kingsnake.

Fuel loading: Average fuel loading across the site is approximately 22 tons/acre with an average fuel depth of 17 inches.

Middle 2 – Located approximately 1.1 – 1.9 miles south of gate at Main Street in Los Lunas on westside levee.

Vegetation. The native overstory vegetation is dominated by relatively large mature cottonwoods (235 trees/ha 5cm DBH) with few Goodding's willows (18 trees/ha). Exotic overstory species include Siberian elm and mulberry. The understory is generally more open than the other sites in this block and consists of salt cedar (127 stems/ha) and Russian olive (72 stems/ha). Other native understory species include coyote willow, currant, and seepwillow.

Birds. Common birds include Black-chinned hummingbirds, Black-headed grosbeaks, Blue grosbeaks, Downy woodpeckers, White-breasted nuthatches, American crows, Lazuli bunting, Indigo buntings, Spotted towhees, Yellow-breasted chats, Bewicks wrens, and Summer tanagers. It is likely that all of these species breed on the site. Yellow-billed cuckoos also occur on this site, and detection rates range from 0 to 2 birds per count-day. Identified nests include Black-chinned hummingbirds, Downy woodpeckers, Bushtits, Spotted towhees, Black-headed grosbeaks, White-breasted nuthatches, Northern flickers, Mallards and Bewicks wrens. Southwestern willow flycatchers were not detected on this plot during either weekly surveys or the standard USFWS Southwestern willow flycatcher surveys in 2000 and 2001 but use this site in migration.

Amphibians, Reptiles and Mammals captured: Woodhouse's toad; Prairie/fence lizard; New Mexican whiptail; desert shrew; deer mouse; Chihuahuan whiptail; Common kingsnake.

Fuel Loading: Average fuel depth across the site is approximately 7 tons/acre with an average fuel depth of 12 inches.

Middle 3 – Located approximately .85 to 1.3 miles south of the gate at Highway 346 in Bosque, New Mexico on the westside levee.

Vegetation. The site was grazed in 2000. The native overstory vegetation is dominated by mature cottonwoods (144 trees/ha > 5cm DBH) with few Goodding's willows (36 trees/ha).

Exotic overstory species include Siberian elm and mulberry. The understory is generally more open than the other sites in this block and consists of salt cedar (415 stems/ha) and Russian olive (325 stems/ha). Other native understory species include coyote willow, currant, and seepwillow. The site has a dense and fairly uniform ground cover of yerba manza.

Birds. Common birds include Black-chinned hummingbirds, Black-headed grosbeaks, Blue grosbeaks, Downy woodpeckers, White-breasted nuthatches, American crows, Spotted towhees, Yellow-breasted chats, Bewicks wrens, and Summer tanagers. It is likely that all of these species breed on the site. Yellow-billed cuckoos also occur on this site, and detection rates range from 0 to 2 birds per count-day. Identified nests include Black-chinned hummingbirds, American crows, Mourning doves, Great horned owls and Ash-throated flycatchers. Southwestern willow flycatchers were not detected on this plot during either weekly surveys or the standard USFWS Southwestern willow flycatcher surveys in 2000 and 2001 but use this site in migration.

Amphibians, Reptiles and Mammals captured: Woodhouse's toad; New Mexico spadefoot; Chihuahuan whiptail; New Mexican whiptail; desert shrew; bull snake; Great Plains skink; Common garter snake.

Fuel loading
Average fuel loading across the site is 19 tons/acre with an average fuel depth of 12 inches.

Middle 4 – Located approximately 4.8-5.6 miles north of the gate at Highway 60 in Bernardo on the westside levee.

Vegetation. The native overstory vegetation is dominated by mature cottonwoods (434 trees/ha 5cm DBH) with relatively abundant Goodding's willows (162 trees/ha). Exotic overstory species include Siberian elm and mulberry. The understory is generally more dense than the other sites in this block and consists of salt cedar (813 stems/ha) and little Russian olive (0 stems/ha). Other native understory species include coyote willow and seepwillow.

Birds. Common Birds include Black-chinned hummingbirds, Black-headed grosbeaks, Blue grosbeaks, Downy woodpeckers, White-breasted nuthatches, American crows, Spotted towhees, Yellow-breasted chats, Bewicks wrens and Summer tanagers. It is likely that all of these species breed on the site. Yellow-billed cuckoos also occur on this site, and detection rates range from 0 to 2 birds per count-day. Identified nests include Black-chinned hummingbirds, Black-headed grosbeaks, Cooper's hawks, and Mourning doves. Southwestern willow flycatchers were not detected on this plot during either weekly surveys or the standard USFWS Southwestern willow flycatcher surveys in 2000 and 2001 but use this site in migration.

Amphibians, Reptiles and Mammals captured: Woodhouse's toad; Tiger salamander; Great Plains toad; Plains spadefoot; Chihuahuan whiptail; New Mexican whiptail; Great Plains skink; desert shrew; deer mouse; Prairie lizard; New Mexico spadefoot; Pocket gopher; Bullsnake/gophersnake; Common garter snake and Plains/blackheaded snake.

SOUTH BLOCK

South 1 – Located approximately 2.9-3.6 miles north of the gate at Highway 60 in Bernardo on the westside levee.

Vegetation. The native overstory vegetation is dominated by mature cottonwoods (343 trees/ha 5cm DBH) with few Goodding's willows (0 trees/ha). Exotic overstory species include Siberian elm and mulberry. The understory is generally less dense than the other sites in this block and consists of salt cedar (217 stems/ha) and little Russian olive (0 stems/ha). Other native understory species include coyote willow, and seepwillow.

Birds. Common Birds include Black-chinned hummingbirds, Black-headed grosbeaks, Blue grosbeaks, Downy woodpeckers, White-breasted nuthatches, American crows, Spotted towhees, Yellow-breasted chats, Bewicks wrens, and Summer tanagers. It is likely that all of these species breed on the site. Yellow-billed cuckoos also occur on this site, detection rates range from 0 to 2 birds per count-day. Identified nests include Black-chinned hummingbirds, Blue grosbeaks, Black-headed grosbeaks, Cooper's hawks, Bewicks wrens, Western wood-peewees, White-breasted nuthatches and Mourning doves. Southwestern willow flycatchers were not detected on this plot during either weekly surveys or the standard USFWS Southwestern willow flycatcher surveys in 2000 and 2001 but use this site in migration.

Amphibians, Reptiles and Mammals captured: Woodhouse's toad; Prairie/fence lizard; New Mexican whiptail; Chihuahuan whiptail; Great Plains skink; Western hognose snake; desert shrew; deer mouse; Couch's spadefoot and Texas blind snake.

South 2 – Located approximately 5.5 miles from the 1-25 Lemitar exit (#156) in the bosque east of the Rio Grande.

Vegetation. The native overstory vegetation is dominated by sparse mature cottonwoods (50 trees/ha 5cm DBH) with few Goodding's willows (0 trees/ha). Exotic overstory species include Siberian elm and mulberry. The understory is unusual in being dominated by New Mexico olive. There is also salt cedar (447 stems/ha) and little Russian olive (0 stems/ha). Other native understory species include coyote willow, seepwillow and screwbean mesquite.

Birds. This site is unusual in having numerous Phainopeplas. Common birds include Lucy's warblers, Black-chinned hummingbirds, Black-headed grosbeaks, Blue grosbeaks, Ash-throated flycatchers, Downy woodpeckers, White-breasted nuthatches, American crows, Spotted towhees, Yellow-breasted chats, Bewicks wrens, and Summer tanagers. It is likely that all of these species breed on the site. Yellow-billed cuckoos also occur on this site, detection rates range from 0 to 2 birds per count-day. Identified nests include Black-chinned hummingbirds, Ash-throated flycatchers, Phainopeplas, Common ravens, Hairy woodpeckers, Downy woodpeckers, House finches, Northern mockingbirds, Gambel's quail, Swainson's hawks, Cooper's hawks, Bewicks

wrens, Western wood-peewees, and Mourning doves. Southwestern willow flycatchers were not detected on this plot during either weekly surveys or the standard USFWS Southwestern willow flycatcher surveys in 2000 and 2001 but use this site in migration.

Amphibians, Reptiles and Mammals captured: Woodhouse's toad; Couch's spadefoot; Desert grassland whiptail; Prairie/fence lizard; Checkered whiptail; desert shrew; deer mouse; Desert spiny lizard; New Mexico spadefoot; Side-blotched lizard; New Mexican whiptail and Common kingsnake.

Fuel loading

Average fuel depth across the site is approximately 7 tons/acre with an average fuel depth of less than 5 inches.

Environmental Consequences

Cultural resources or historic properties are not known to exist in the Study area. These bosque sites are part of the Rio Grande floodway that was disturbed in past years by river flooding, by the creation and reconstruction of the flood control levees and the installation of Kellner ("jetty") jacks for flood control purposes. The Lemitar site (South Block 2) was previously west of the Rio Grande as evidenced by an old river channel, which appears on aerial photos, and by MRGCD land ownership records. During the Rio Grande Channelization Project (1950s and 60s), the river bed was shifted to the west in the Lemitar area. In the unlikely event that cultural resources are discovered on project sites, work would cease in the vicinity of the discovered object(s) and a consultation with the New Mexico Historic Preservation Office would be initiated. The MRGCD and the City of Albuquerque Open Space Division (for lands within the Rio Grande Valley State Park) have determined that there will be no impacts to individual listed endangered, threatened, candidate, or species of concern as a result of the Study and concurrence has been requested from the U.S. Fish and Wildlife Service Ecological Services Field Office.

There are four remaining areas of concern when evaluating the environmental consequences of the proposed action. These include the impacts to songbirds and bats resulting from fuels reduction, the effects on air quality resulting from prescribed fire, the environmental fate of chemicals used in herbicide applications, and the Study's cumulative impacts throughout the Middle Rio Grande valley.

Impacts to Songbirds and Bats Resulting from Fuels Reduction

Numerous neotropical migratory bird species are ranked as management priorities by Partners in Flight (PIF), a national consortium of government and private groups that supports bird conservation. New Mexico PIF rates riparian conservation as essential to benefit neotropical migrants, several species' populations of which are reported by Breeding Bird Surveys to be declining. Mid-story and canopy-nesting neotropical migrants that could be affected by catastrophic fire include the Yellow-billed cuckoo, a bird species repeatedly petitioned by environmental groups to be federally-listed as Threatened or Endangered. Short-distance migrants such as Spotted towhee, Song sparrow and Blue grosbeak may also respond numerically to treatments that remove midstory habitat structure. Some ground and shrub-nesting neotropical migrants that could be potentially affected by removal of exotic plants or downed wood include Common yellowthroats, Yellow warblers, MacGillivray's warblers, Yellow-breasted chats, and Lucy's warblers.

Removal of standing snags and mature exotic woody plants could conceivably have either positive or negative effects on canopy-nesting and canopy-foraging migrants such as Black-headed grosbeaks, Summer tanagers, Yellow-billed cuckoos, Western wood-pewees by opening the canopy and removing perch sites. Such treatments may also alter quantity and composition of food supplies (e.g., foliage arthropods, bark beetles), but without research, it is impossible to know whether effects of fuels reduction on birds would be positive, neutral or negative. Removal of dead wood, especially standing snags, to reduce fuels may eliminate nest sites and foraging substrates for cavity-nesting birds such as woodpeckers, Bewick's wrens and Ash-

throated flycatchers. Along the Middle Rio Grande, riparian forests and open water are commonly used by many bat species for feeding, roosting and commuting. Despite their importance in ecosystems as the primary nocturnal predators of insects, bats have been paid very little attention historically by researchers or managers. Changes caused to cottonwood forest structure and composition by removal of understory invasive plants and dead wood may affect the use of these forests by bats. These impacts must be identified, evaluated, and weighed against the merits of invasive plant control and fuels reduction, and the effects of habitat destruction resulting from catastrophic fire.

Prescribed Burning and Air Quality

Air quality will be temporarily reduced during winter prescribed fire events. Generally the time involved in prescribed burning is less than 60 hours. To minimize these effects, forecasted conditions will be modeled to predict burn effects and burn prescriptions are written to avoid inversion conditions, which result in poor air quality. Prescribed burning may affect small mammal populations where the effects of extreme heat on burrowing animals are unknown. These animals may however withstand passing fires safely within their burrow systems. Prescribed burning will occur outside avian breeding seasons and winter birds should be able to easily move to adjacent habitats to avoid direct impacts. Additionally, arthropod species may be using the site during prescribed burning and would be directly impacted.

Herbicide Application and the Environmental Fate of Chemicals

Fuels reduction will require the removal of exotic trees and shrubs below cottonwood canopies. Without mechanical control to remove the root crown, or an herbicide application in combination with removal, vegetation densities frequently return to pre-treatment conditions with 3-4 years (Taylor and McDaniel 1998). An effective control for the species is aerial removal followed immediately by a stump application of Garlon 3a herbicide (44.4% active ingredient triclopyr) during periods when plants are actively growing (Dow AgroSciences, 1999). Where exotic tree diameter is 2 inches or less at ground level, Garlon 4 (61.6% triclopyr) combined with a vegetable oil carrier may be sprayed directly on branches and stumps for control. Garlon is a pyridine compound providing effective control on woody brush species and broadleaf herbaceous plants through growth inhibition. The herbicide is selective and systemic and is rapidly absorbed by foliage and roots where it is translocated throughout the plant. Garlon 3a herbicide is applied at a 50/50 percent mix with water to the exposed cambium following stump exposure. Garlon 4 is basally applied at a mix of 25% herbicide to 75% vegetable oil (Parker and Williamson, 2000). Herbicide applications to exotic trees are extremely localized and therefore have little if any impact on nontarget plants or wildlife.

Garlon is effectively degraded by soil microorganisms and has a moderate persistence in soil environments (average half-life of 46 days). Reported half-lives in water are 2.8 to 14.1 hours with photolysis providing the most important breakdown process. Triclopyr is not strongly adsorbed to soil particles and has the potential to be mobile. This potential problem will be averted by localized applications to cut stumps or branches (EXTOXNET, 1996).

Triclopyr did not cause cancer in laboratory animals. Triclopyr is slightly to practically non-toxic to birds (1698 mg/kg for mallard ducks), slightly toxic to mammals (310-713 mg/kg) and is low in toxicity to fish (117 ppm for rainbow trout) (EXTOXNET, 1996). No wetlands are in the vicinity of application sites. The probability that Garlon would affect invertebrates or fish when applied to cut stumps or branches is therefore extremely low. Based on test results submitted to the Environmental Protection Agency by Dow Elanco Corporation, the direct and indirect impacts of Garlon 3a and 4 on representative wildlife in the project area are expected to be negligible when applied according to label specifications (Dow AgroSciences, 1999).

Cumulative Impacts

This EA addresses treatments on lands owned by the Middle Rio Grande Conservancy District. As previously stated, the MRGCD and COA Open Space Division will implement treatments on seven sites with a total of 343.78 acres. Other treatments will occur on adjacent bosque lands at the Pueblo of Cochiti and the Bosque del Apache National Wildlife Refuge. Each land management agency is responsible for implementing treatments as part of the Study on sites they administer but each entity must also address the cumulative impacts of the treatments on all Study sites. A total of 818.92 acres will be utilized for the Study, of which 211.67 acres are control sites that will receive no treatments.

Table 5. Acreage Within Each Experimental Block of the Bosque Fuels Reduction Study in the Middle Rio Grande Valley, New Mexico.

Block	Treatment Acreage	Control Acreage	Total Acreage
Cochiti Pueblo	159.85	54.32	214.17
North	152.22	39.70	191.92
Middle	153.18	46.37	199.55
South	142.00	71.28	213.28
Total	607.25	211.67	818.92

The full suite of treatments (mechanical removal of dead and down wood and exotic trees with herbicides applied to cut stumps or branches, low-intensity prescribed fire and revegetation with native species) will occur within each block in the Middle Rio Grande valley. Impacts to air quality, flora, and fauna due to prescribed fire will be mitigated and public safety assured through strict adherence to burning prescriptions and ample engine and crew resources on site. Areas of actual or potential noxious weed infestations within sites to receive prescribed burn

treatments will be identified and treated prior to burning. Garlon 3a and 4 herbicides used to treat exotic plants will pose minimum risks to wildlife and the surrounding environment with application directly and only to cut stumps or branches. Cumulative impacts resulting from the removal of dead and down wood and exotic woody plants on over 600 acres of cottonwood gallery forest may have positive or negative effects on canopy-nesting and canopy-foraging migrant songbirds and bats. Without the accompanying research outlined in the attached Study Plan, an understanding of these effects is not possible. The destruction of much of this acreage from catastrophic wildfire is imminent without prompt action to reduce fuel loading. To mitigate potential negative effects, all blocks will not be treated at the same time. Blocks will be treated over the next 3-4 years, starting with the North Block and Cochiti Pueblo Block.

Overall, the possible negative short term effects of prescribed burning and herbicide application should have minimal impacts to the environment. Cumulative impacts of treatments administered through this research proposal will be mitigated through treatment applications by block over a period of 3-4 years. Impacts to songbirds and bats may be positive or negative in the short term due to habitat modifications but are likely to be positive in the long-term due to protection from catastrophic fire. The research component of this project will evaluate these impacts and provide sound guidance to resource managers in the Middle Rio Grande valley as they attempt to avert catastrophic fire through fuels reduction activities.

Consultation and Coordination with Others

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Appendix A

Study Plan for

"Effects of Fuels Reduction and Exotic Plant Removal on Vertebrates, Vegetation and Water Resources in the Middle Rio Grande Bosque"

Appendix B

Study Site Location Map

Appendix C

Photos of Bosque Fuels Reduction and Fuel Loadings